Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Molecular Beam Epitaxy of Remotely-Doped Sb Quantum-Well Structures[1] MICHAEL SANTOS, KAUSHINI WICKRAMASINGHE, SHAYNE CAIRNS, JEREMY MASSENGALE , ZHONGHE LIU, CHOMANI GASPE , TETSUYA MISHIMA, JOEL KEAY, MATTHEW JOHNSON , SHEENA MURPHY, University of Oklahoma — The Dirac point for the topological surface states in antimony (Sb) is at the Γ point. Bulk Sb is a semimetal with neither the conduction band minimum nor the valence band maximum at the Γ point. Our goal is to study the transport properties of the topological states by suppressing the bulk conductivity through quantum confinement and enhancing the surface conductivity through remote n-type doping at the Γ point. A series of Sb quantum-well (QW) structures were grown by molecular beam epitaxy using GaSb barrier layers and GaSb substrates. Conductivity measurements on undoped Sb QWs, 0.7 to 6 nm thick, show a suppression of the bulk states, such that the surface conductivity is about 20% of the total conductivity for a 3.8 nm-thick QW. Interpretation of Hall-effect measurements, which nominally indicate p-type conduction for undoped QWs, are complicated by the presence of both electrons and holes. We have begun experiments to populate the topological electron states by doping the GaSb barrier with Te atoms, creating donor states at the Γ point. We observed that the Hall coefficient decreases with the GaSb spacer thickness from 90 to 20 nm. We have carried out experiments at magnetic fields up to 18 T to separate the multiple carrier channels.

[1]This material is based upon work supported by the National Science Foundation under Grant Nos. DMR-1207537 and DMR-1229678.

Michael Santos
University of Oklahoma

Date submitted: 11 Nov 2016 Electronic form version 1.4